



UNITED STATES NAVY

MEDICAL NEWS LETTER

Vol. 37

Friday, 6 January 1961

No. 1

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Use of funds for printing this publication has been approved by the Director of the Bureau of the Budget (19 June 1958).

Diagnosis of Angina Pectoris

E. Cowles Andrus, Cardiovascular Division of the Department of Medicine, Johns Hopkins University, Baltimore Md. Symposium on Coronary Heart Disease - Diagnosis of Angina Pectoris. Circulation 22: 979-985, November 1960.

The myocardium is to a critical degree dependent upon its contemporary blood supply. In contrast to skeletal muscle which can perform work beyond the capacity of its aerobic metabolism to support, thus acquiring an oxygen debt, heart muscle continuously requires oxygen supply and irrigating blood sufficient for its immediate demands. Replenishment of its energy stores and removal of metabolites must literally be accomplished between beats. The rate of oxygen extraction from blood in the coronary system is correspondingly high, the difference between arterial and venous blood being 60 to 70%; even when the heart beat is arrested, myocardial oxygen consumption is measurably greater than that of skeletal muscle.

With aging and disease, coronary blood flow may become compromised and impeded to a serious degree. Despite development of some collateral anastomoses with other more fully patent coronary vessels, blood supply may become insufficient over large or multiple areas of the myocardium when generalized coronary arterial changes limit the maximum increase upon demand or locally, when changes in a single artery or its branches obstruct the flow in the domain of that vessel.

Because coronary artery disease and coronary insufficiency were first recognized as cause and effect, there has existed a compelling urge to confirm the diagnosis and to gain some hint regarding prognosis by objective means. When the myocardium has suffered manifest injury in the process, this may not be difficult; but pain as the principal, and sometimes only, symptom eludes even the most modern recording devices.

Thus, 188 years after Heberden, the most rewarding procedure in diagnosis of angina pectoris is still an unhurried interview with the patient. Indeed, the patient's own account of the distress, its distribution, and the circumstances under which it appears or subsides establishes the diagnosis in the vast majority of cases.

Clinical Features

Description of the various features of typical pain are now classic and well known. Equally significant to the diagnosis are the conditions provoking pain and the circumstances under which it subsides. Characteristically, it appears under stress—exertion, anger, "aggravation," or excitement—and abates promptly (in a matter of minutes) with rest or under the effect of nitroglycerin. The effect of any or all of these inciting causes is evidently

potentiated after a meal—which may in itself call forth a 25% increase in cardiac output—by a cold environment or during a state of anxiety.

Obviously, pain or distress in the areas and structures of characteristic distribution may not be due to angina pectoris. With acute pericarditis, precordial pain may be present and intense; anxiety is accompanied by a sense of "weight on the chest"; patients with neurocirculatory asthenia complain of "heartache" or stabbing pain; postural strain can provoke spasm and aching in the pectoral muscles; periarthritides of the shoulder may be associated with pain confusingly similar to that of angina pectoris. The patience and ingenuity of the examiner may be taxed to obtain an exact and detailed story of the patient's symptoms in such cases, but even here the history is the foundation of the diagnosis; the most important clue—when it can be elicited—is the inciting relationship between exertion or excitement, particularly after eating, and the onset of pain.

Far more difficult to evaluate is pain or discomfort typical of angina pectoris in quality and distribution, but coming on when the patient is quiet, at rest, at the beginning of a meal, or even in bed. Frequently, it appears that these and some of the other examples of angina pectoris at rest may be set off by visceral reflexes conveyed via the vagus from the esophagus, stomach, or diseased gallbladder. Probably, this effect is significant only when superimposed upon the consequences of coronary disease. The effect of adequate doses of atropine may be dramatically helpful in diagnosis.

In any event, accurate appraisal of symptoms is especially urgent in that such pain has much in common with manifestations of imminent myocardial infarction. When a history suggests angina pectoris, some confirmation may be gained by discovering conditions that would contribute to development of coronary insufficiency. When observed during an attack of angina pectoris, however, the patient may display no objective change from his previous status beyond pallor and sweating. Commonly, the blood pressure rises while pain is present; or transient signs of left ventricular failure (pulmonary congestion or gallop rhythm) may be detected and frequent extrasystoles or other arrhythmias may sometimes appear.

Electrocardiography

Abnormalities in the electrocardiogram recorded at rest and in the absence of pain may add to the examiner's suspicion that a patient suffers from angina pectoris insofar as these may indicate prior myocardial damage. In the large majority of instances the diagnosis can be made without resort to electrocardiography, but in doubtful cases it is often helpful. Under such circumstances no effort should be spared to obtain a record during an attack. After careful questioning one should try to reproduce the circumstances that regularly provoke distress, such as exercise after a meal or, if necessary, should send the electrocardiographer to the patient to obtain a record during his daily activity.

Failing this, one may resort to one of the more or less standardized stress tests, such as exercise or induced hypoxemia, which may provoke the characteristic attack or engender changes in the electrocardiogram. In the writer's experience, this is necessary in well under 10% of cases. Properly and carefully conducted, these tests are not hazardous, but no patient should be subjected to such stress whose electrocardiogram taken at rest immediately prior to the test is already indicative of myocardial ischemia. Moreover, patients who show conspicuous electrocardiographic changes after stress should be reexamined on the next day with another record at rest.

The usefulness of stress tests—indeed their validity—depends upon the ability of the examiner to distinguish abnormalities from variations in the electrocardiogram that appear after stress in the absence of significant disease. Except for the unusual instance in which bundle-branch block develops following exercise or hypoxemia, the meaningful electrocardiographic changes indicating myocardial ischemia involve the S-T segments. This is the same area where insignificant changes also occur. Since changes in the electrocardiogram after stress have so much in common with those that accompany tachycardia, it is no wonder that definition of positive and negative results of stress tests has met with some difficulties. The author, using the 2-step test of Master and Oppenheimer, regards the following changes after standard exercise as indicative of coronary insufficiency:

1. S-T deviation of 1.5 mm or more with flattened or downward-sloping S-T segment in the limb leads or lateral chest levels
2. Inverted or diphasic T wave in leads I or II or lateral chest leads
3. Development of bundle-branch block or appearance of frequent extrasystoles

The significant changes in the electrocardiogram may not follow immediately after stress, but may appear and progress during a period of from 1 to 15 minutes after exercise.

The result of a given test is diagnostically useful only if it is unequivocally positive, in which event, like angina pectoris itself, it is indicative of severe localized or multilocular myocardial ischemia; it has no place as a means of "ruling out" coronary artery disease or angina pectoris. The test result testifies only to the contemporary status of the coronary circulation; except when extreme S-T deviation follows stress, it is not yet possible to attach quantitative significance to the degree of abnormality produced.

Perhaps, as the natural history of coronary artery disease is more fully disclosed by careful follow-up studies, stress tests may acquire more prognostic value. At present, however, the result of the stress test is simply another datum to be used by the patient's physician against the background of his history, symptoms, and physical signs.

Ballistocardiography

Ballistocardiography as a technic for detecting coronary artery disease or predicting its overt consequences is still in an evolutionary stage. The interpretation of the ballistocardiogram has so far depended principally upon empirical correlation with clinical states otherwise defined rather than upon controlled physiologic experiments. However, it can serve to provide additional data regarding the likelihood of coronary disease in a patient under 40 years of age; if it is abnormal at rest or after exercise or smoking; or if the record deteriorates during an attack of pain.

* * * * *

Effects of Stress on Gastric Secretion

René Menguy, Department of Surgery, University of Oklahoma Medical Center, 800 N. E. Thirteenth St., Oklahoma City, Okla. Effects of Stress on Gastric Secretion. Amer J Dig Dis 5:911-916, November 1960.

Recently, there has been considerable interest in the experimental gastric ulcer occurring in the glandular portion of the rat stomach during various stressful situations. The possibility of producing an experimental ulcer by stress is attractive because of the well known fact that human gastric ulcers may be precipitated by stress. Although the so-called "Cushing" and "Curling" ulcers are the better known variants, superficial hemorrhagic gastric erosions are a frequent postmortem finding in patients dying of an acute illness. It is commonly thought that stress ulceration of the stomach is the result of stimulation of gastric secretion via neural and hormonal pathways.

The author undertook a study with a threefold purpose: (1) to determine the constancy of gastric ulcers produced by restraint stress under experimental conditions; (2) to learn what changes in gastric secretion, if any, were produced by the same stress; and (3) to determine whether rats could be protected from stress ulceration by blocking neural and hormonal pathways affecting the stomach.

In 100% of the stressed rats the glandular portion of the stomach contained 1 to 10 superficial hemorrhagic gastric erosions. Often, two large ulcers were found in apposition on the anterior and posterior surfaces of the stomach. The most remarkable aspect of this experimental lesion was its constancy under the experimental circumstances described.

Comparison of gastric secretory activity of stressed rats with that of unstressed controls revealed a 94% inhibition of average HCl output in the group of restrained rats. On the basis of this data, it would appear that in rats submitted to a stressful situation capable of producing gastric ulcers,

gastric secretory activity is not stimulated but rather depressed to a considerable degree. This suggests that acid-peptic digestion is not the mechanism responsible for restraint ulcers of the rat.

The author's attempts to protect the stressed rats from ulceration are not revealing. Failure of hypophysectomy and adrenalectomy to prevent ulcer formation only confirms previous work. Vagotomy definitely provided considerable protection; this cannot be explained by a decrease in gastric secretion. Alteration in gastric blood flow or delayed gastric emptying are other possible explanations for the protective action of vagotomy. In other experiments the author found that treatment with chlorpromazine prevented restraint ulcers. These data are difficult to interpret because of the diverse pharmacologic effects of this drug.

Recently, it has been suggested that the rat restraint technic be applied to evaluation of antiulcer drugs. Because of the obvious differences between this experimental lesion and human peptic ulceration, there would be little basis for applying results of such studies to human ulcer diathesis. Nevertheless, the restraint ulcer of the rat is similar in many respects to acute gastric erosions occurring in human beings exposed to stress.

* * * * *

Polycythemia Vera

P.G. Rigby, B.S. Leavell, Department of Internal Medicine, University of Virginia School of Medicine, Charlottesville, Va. Polycythemia Vera. Arch Int Med, 106: 622-627, November 1960.

Polycythemia vera was first described by Vaquez in 1892. Osler, in 1904, collected 6 cases and proposed that this syndrome constituted a new clinical entity. At the present time, polycythemia vera is usually classified as one of the myeloproliferative syndromes because apparent transformations among polycythemia vera, acute leukemia, chronic myelocytic leukemia, myelofibrosis, and di Guglielmo's syndrome have been observed; however, the cause of all these syndromes remains obscure. Polycythemia vera has been the subject of some excellent reviews.

The authors review the clinical course, complications, and prognosis of polycythemia vera as exemplified by a group of 50 patients, with particular reference to the problem of surgical risk in the disorder.

The characteristic clinical picture and many of the complications of polycythemia have been attributed to an absolute increase in the number of red blood cells which results in an increase in the volume and viscosity of the circulating blood. Therapy has been directed mainly toward modifying this aspect of the disease. In recent years increases in platelets and white blood cells have attracted more attention than previously.

It has been postulated that patients with this condition who develop leukemia do so because of a "predisposition." They usually present elevated white blood cell counts and increased numbers of immature white blood cells in their peripheral blood. In the authors' series, 4 of the 5 patients who developed leukemia or myelofibrosis had prior leukemoid reactions. The average survival time of the patients with leukemoid reactions was equal to that of the other patients. In the series, 4 of the 5 patients with myeloproliferative shifts outlived the average survival time of the entire deceased group. One observer has asserted that leukemia tends to develop in those patients who live the longest with their disease.

Although there is disagreement as to whether administration of radioactive phosphorus may contribute to development of leukemia, the duration of life in patients treated with radioactive phosphorus has been prolonged. Shifts from polycythemia vera to leukemia were observed before introduction of radioactive phosphorus; in addition, employment of this isotope has not increased the occurrence of leukemia over what may be expected with improved survival. Recent studies have indicated an increase in the overall incidence of leukemia, both related and unrelated to radiation.

Prognosis in polycythemia vera appears to be significantly influenced by therapy. In the authors' experience, the incidence of thrombotic and hemorrhagic complications was greater in those patients who received no therapy or only phlebotomy, and the survival times of these patients were less than those who were treated with x-ray and/or radioactive phosphorus. Therapy that induces marrow inhibition appears to be important in reducing the incidence of vascular complications and prolonging life. Antimetabolic drugs have been used in an attempt to depress the activity of the bone marrow; some have serious disadvantages, others show promise.

The paradoxical tendency in polycythemia vera to both thrombosis and hemorrhage is puzzling. These complications occur not only in untreated patients, but also in those who are supposedly "under control." Excessive clotting has been attributed to increased blood viscosity and increased numbers of platelets; the occurrence of hemorrhage has been attributed to distention of the capillary walls. However, recent studies have revealed abnormalities in the clotting of thrombocythemic blood in the form of an increased clotting rate and defective clot retraction. It is proposed that a coagulation defect is responsible for the excessive bleeding in this disease because spontaneous bleeding is rare, and hemorrhage—when it occurs—usually follows some form of trauma.

The incidence of hemorrhagic and thrombotic complications following surgical procedures in the series was 33% comparing closely to other reports. At present, treatment of polycythemia vera—especially those with thrombocythemia—prior to surgical procedure seems indicated when possible. Reduction of peripheral blood counts to normal levels by phlebotomy appears to be the minimum requirement; marrow inhibition over a period of months is desirable in any elective surgery.

Expanding Role of the Urologist

William J. Engel, The Cleveland Clinic Foundation, 2020 E. 93rd St., Cleveland 6, Ohio. The Expanding Role of the Urologist in Diagnosis and Surgical Treatment of Renal Diseases. J Urol 84: 594-598, November 1960.

It seems timely to draw attention to the increasing opportunity of the urologist to provide better diagnostic information relating to renal diseases. More complete diagnoses inevitably lead to better treatment and may contribute new knowledge regarding the nature and course of diseases of the kidneys. Urology has come a long way from the not-too-distant days when its almost sole concern was with venereology. Methods have been developed to establish remarkably accurate anatomic diagnosis and, now that disorders of function are of increasing importance, methods must be devised to bring more information to this field. Results from the experimental laboratory have in many instances now found their clinical counterparts.

The author discusses some areas wherein the talents of the urologist may be useful in providing the improved diagnosis upon which improved treatment depends.

Renal Hypertension

Hypertension may have several causes. Any such case must be given preliminary study to establish the presence or absence of endocrine causes, such as pheochromocytoma, or to determine whether the case can be considered to be in the large category of essential hypertension. As a clinical guide, one must suspect renal hypertension in all young hypertensive individuals, in any patient with a sudden onset of hypertension, and in all patients having accelerated or malignant hypertension.

Methods of Study. Urography—The intravenous urogram is an essential means for study of hypertensive patients. Unilateral delayed or diminished renal function may be significant. Of special importance is the evidence in regard to size and configuration of the renal mass. Careful interpretation of the urogram has additional importance as a means of selecting patients for aortography.

Aortography—With the advent of abdominal aortography and development of a safe and simplified technic, it became possible to visualize the arterial circulation of the kidney. Aortography is a minor surgical procedure and should be performed in the operating room where the usual aseptic precautions are observed.

Retrograde pyelography—This procedure is necessary in many cases. When the urogram shows no function unilaterally and if the retrograde pyelogram on the affected side reveals an anatomically normal renal pelvis, one may correctly assume that there is obstruction in the main renal artery.

There will be other situations in which a retrograde pyelogram will be required for complete diagnosis and evaluation.

Differential renal function tests—Although differential renal function tests may provide useful information, they cannot replace a good aortogram for identification of renal arterial obstructions producing hypertension. The diagnostic value of radioactive diodrast renograms is about equivalent to that of good intravenous pyelograms as a screening test for hypertensive patients.

Treatment. The favorable results of surgical treatment of hypertension due to renal arterial obstruction have been impressive, yet surgical treatment may not be indicated in all cases. Some patients may be managed comfortably with medical treatment. Further investigations into the cause of the underlying vascular disease may lead to new methods of prevention. However, the demonstrated benefits of surgical treatment in properly selected cases have firmly established its place in present-day treatment of renal hypertension.

The urologist must be alerted to hypertension produced by perirenal compression. In recent years, the author has operated upon two young men with hypertension due, in one patient, to an encapsulated hematoma, and in the other, to a calcified perirenal hematoma, both of which occurred after football injuries. A similar perinephritis producing hypertension has been reported following a pelviolithotomy associated with postoperative perirenal infection.

Renal Biopsy. In recent years, needle biopsy studies of internal organs have become standard diagnostic procedures. Renal biopsy seems best suited to urologic practice. Renal biopsy specimens may be obtained either by the percutaneous needle biopsy method or by open renal biopsy through a limited surgical approach. In either case, it is a minor surgical procedure best carried out under operating room technics.

The value of needle biopsy studies cannot be denied, but perhaps the limitations and dangers have not been sufficiently emphasized. This is not to condemn entirely needle biopsy as there assuredly will be instances in which the condition of the patient favors such a quick closed method. In general, however, the author prefers open renal biopsy. Local anesthesia may be employed; through a limited incision in the flank, a good and predictably adequate specimen can be removed under direct vision. It is even possible to obtain biopsy specimens from two dissimilar areas. Hemostasis may be accurately controlled and the wound may be closed without drainage.

When is renal biopsy indicated? For clinical purposes, it has two broad indications: (1) to determine accurately the exact nature of the renal disease when the clinical picture is unclear and the resulting information may significantly influence treatment; (2) when renal failure or uremia requires treatment with the artificial kidney. Results of biopsy may allow a determination as to whether continuation of treatment is advisable.

Acute Renal Failure

The role of the urologist in care of the patient in acute renal failure will vary with provisions and equipment established in his particular locality. He is an important member of the team in the care of the acutely anuric patient. Ureteral obstruction must be borne in mind in many cases. Bilateral ureteral calculi must be considered, and bilateral obstruction from sulfonamide crystals, now uncommon, must still be considered. It is gratifying to record that renal decapsulation—once in vogue without rational basis for treatment of anuria—has apparently been discarded as a therapeutic measure. While operative measures are rarely required in management of acute renal failure, the urologist should be prepared to manage these cases—at least in the early phases.

Pyelonephritis

There are many unsettled questions regarding this condition; the causes are not yet clear. The term calls to mind an infection; yet in many cases, urine cultures are sterile. In one series, carefully cultured needle biopsy specimens resulted in positive cultures in only 36% of patients with suspected pyelonephritis, and in only 56% of patients in whom pyelonephritis was the primary lesion. Pathologic changes are not regularly related to the clinical symptoms. The natural history of the disease is not known. Is it a relentlessly progressive disease in all cases? Do some heal? Is it a recurring disease? Is it related to nephrosclerosis? These are all unanswered questions that require further careful study. Perhaps urologists will put their minds to solving some of these questions.

The Kidney and Erythropoiesis

Presence of an erythropoietic factor in the circulating blood appears to have been well established clinically and experimentally. This has been called "hemopoietine" or erythropoietic-stimulating factor (ESF). The exact source of this factor is not known, but there is considerable experimental evidence that the kidneys play an important role in production or activation of hemopoietine. Morphologic studies suggest that the juxtaglomerular cells might be concerned with this function.

Clinicians have long recognized that anemia has often been associated with chronic renal disease and, more recently, the association of polycythemia with renal tumors or hydronephrosis has been noted. Therefore, the urologist must extend his interests into the field of hematology as well as into all types of renal disease in order to bring to his colleagues in medical practice helpful diagnostic assistance. The patient will, of course, receive the ultimate benefit.

* * * * *

School Vision Testing

Albert E. Sloane and Perry Rosenthal, 416 Marlborough St., Boston, Mass. School Vision Testing. Arch Ophthal 64: 763-770, November 1960.

The school population represents a most challenging and fertile area for the practice of preventive medicine. The role attributed to defective vision as a cause of unsatisfactory school progress led to the early establishment of school vision testing programs. Although belief in the importance of the visual sense in scholastic achievement has not diminished, over the past 20 years certain modifications in the educational philosophy of learning have occurred which have shifted the emphasis of vision from a predominantly functional role toward its rightful place as an integral part of the general health care of the child.

The estimate has been made that 20 to 30% of the 33 million children of school age in this country suffer from visual defects that require professional care. Therefore, the ideal goal of periodic complete eye examinations for all children is, at the present time, impractical and indeed wasteful. The problem thus resolves itself into the search for methods which would select only those children in need of professional evaluation. All children who are handicapped by reading disabilities or those with obvious eye defects or symptoms suggesting eye discomfort should be referred for a complete eye examination regardless of their performance in preliminary tests. However, children are frequently unable to recognize limitations in their visual sense so that the criteria of symptoms alone would be inadequate.

Screening procedures attempt to indicate the probability of the need for special eye care. Ideally, the outcome of these tests should correspond to the results obtained by the ophthalmologist in his office. However, because of several variables there will always be children in need of eye care among those who pass the test (underreferral) as well as children needlessly referred to ophthalmologists (overreferral).

The general agreement may be that the lesser evil is one of overreferral, yet overreferral has received the most criticism. It has been suggested that it would be wiser to miss a few children in need of eye care than to lose the parental respect for the screening method. However, the attitude of these parents is, to a large degree, determined by the attitude of the consulting physician. Many practitioners are too busy and too easily annoyed when asked to examine normal children referred by nonprofessional sources.

Modifications of existing screening procedures have been introduced in an attempt to reduce the number of overreferrals. Another approach at reducing the number of overreferrals has been to change the cutoff levels of the tests or, in other words, to lower the passing standards. Most of the well established programs have incorporated a test-retest routine for all failures.

Despite these approaches, studies illustrate the difficulty in predicting the efficiency of school vision screening tests or referral standards without subjecting them to a well controlled field study first.

Another area in need of direction is that pertaining to, "Who should give the test?" On occasion, ophthalmologists have offered to do the vision testing as a public service. In most instances, an attempt is made to have trained technicians conduct the tests. One committee even considered that it was not best to have a professional person conduct the test.

The question arises, "How often should the tests be given?" Ideally, of course, every child should be tested once each year. However, administrative difficulties often restrict implementing such comprehensive programs. The best compromise appears to be that which recommends a test for visual acuity every year and a test battery repeated every second year. Teacher observation at all times should be encouraged.

One of the prime requisites of any screening program is an efficient administrative section. Of special importance are records of individual test performances, form letters to parents of children failing the test, questionnaires for the ophthalmologist regarding recommendations for his patient that may be followed in school, and agencies responsible for the follow-up of all test failures.

To solve the various problems related to vision testing of children—school age and pre-school as well—the author would strongly urge that a committee be appointed to consist of members representing all major ophthalmologic societies. This committee would work closely with a strong lay organization, such as the National Society for the Prevention of Blindness, which would act as liaison between the committee and all individuals or groups interested or already active in school vision testing. The objectives of the committee would be:

1. Establish clinical criteria indicating the need for special eye care in children.
2. Encourage and perhaps supervise large, well-controlled field studies which would evaluate the efficiency of various screening tests and their components.
3. Publish information and provisional recommendations regarding use of tests and standards of referral; and, create and maintain a continual awareness among ophthalmologists of the problems and advances in this field.
4. Provide leadership and guidance to all groups interested in this field and stimulate awareness among all people who are concerned with the health problems of the school population of the great need for such a program.

* * * * *

Should the Cancer Patient be Told?

Edward M. Litin, Section of Psychiatry, Mayo Clinic and Mayo Foundation, Rochester, Minn. Postgrad Med 28: 470-475, November 1960.

The question of whether or not to tell a patient that he has cancer is perhaps one of the most controversial and one of the most sensitive in the field of medicine. The psychiatric viewpoint on this subject is somewhat theoretical in that psychiatrists rarely are directly involved when a diagnosis of cancer is made and is to be discussed with the patient.

To most people, the word "cancer" brings up the word association of "death." This would imply that to tell a patient he has cancer is equivalent to telling him he is going to die. This has been a potent argument used by many physicians who have avoided telling a patient he has cancer. But it is not a valid reason for withholding the truth; with few exceptions, the diagnosis generally can, and should, be discussed with the patient fully and honestly. Exceptions to this policy depend on the reaction pattern of the individual patient.

Guideposts to Types of Reactions. There are guideposts a physician can use to prognosticate how his patient will react to the disclosure that he has cancer. These include the phases that one might expect the average person to experience when he is told such a fact.

Initial shock with acute feelings of fear and depression—This is fortunately a short-lived phase; sometimes it is not seen at all due to the fact that the patient has been strongly suspicious or aware of the fact that he has cancer. This initial-shock phase is accompanied by great anxiety and feelings of unreality; it passes relatively rapidly to a second phase.

Early measures dealing with stress and threat to life—This phase is marked by usage of a common and somewhat protective psychologic defense—denial. This is the most commonly used defense employed by the personality to protect itself against overwhelming catastrophic anxiety. This attitude must be treated with patience because abrupt disregard may precipitate severe panic, psychosis, or even suicidal reaction. In most cases there is an "agonizing reappraisal" of self, then an acceptance and integration of the reality of the cancer and its full implications.

Extension and completion of the second phase—In the third phase, the patient gradually attains a new picture of himself with altered perspectives, goals, and at times, behavior and appearance. It is the long-term, successful adjustment to the new realities.

There are definite indexes that will point to a successful and rapid completion of these three phases. The history of successful adaptation to previous periods of stress and of good current adjustment in work and relationships with other people is of great importance. A successful marriage in which the partner is supportive and one with whom the patient can freely

and openly communicate is a tremendous advantage. An obvious aid is the presence of a warm sympathetic mature physician who can enter into an honest frank doctor-patient relationship and who can be depended on to deliver the truth and a careful explanation about the patient's condition.

If all these factors are present, the physician need have no hesitation about informing the patient that he has cancer and discussing it fully with him. If all or most of these factors are absent, there is some justification in withholding the diagnosis because psychiatric complications would be a possibility and the third phase would not be successful.

Bearing of Type of Cancer on Question. The location and type of cancer, its relative benignancy or malignancy, and the stage at which it is discovered—all have a bearing on the basic question. Obviously, it makes a great difference if the lesion under consideration is relatively superficial and benign, one that the physician can eradicate completely and permanently. No one wants to be the bearer of sad tidings; it is natural to be reluctant to tell a person that he has cancer, especially when it cannot be coupled with an assurance that it can and will be completely eradicated.

Reasons for Not Telling the Patient. The principal reason is that to most people the diagnosis of cancer is tantamount to a death sentence. But this, in its entirety, is not true. Even when the prognosis is apparently hopeless, most physicians would agree that a hopeless attitude should never be adopted toward a patient with cancer. This is not meant to imply that it is either ethical or desirable to promise an improbable cure. The ingredient of hope, however, has always made an intolerable burden easier to bear. The reassurance of relative comfort—even when there is little hope to offer—is also important and can be carried out to a great extent with the new narcotics and tranquilizing agents.

Another frequent reason given for not telling the patient is the fear of a severe emotional break and even suicide. Usually, people are far less brittle than others think them to be. Adjustment to the new situation is admittedly less comfortable than the precancerous period, but it is certainly more comfortable than persistent feelings of doubt, suspicion, and distrust and inability of the patient to discuss his condition in detail. Along with the idea that people generally are not emotionally strong is the idea they are not very perceptive and sensitive. Is it really thought that the cancer patient does not know in a short time that he, in fact, does have cancer? These patients are usually relieved when they have someone who can talk to them about cancer.

Actually, suicide following knowledge of cancer is quite rare. People do want to live, and they carry the spark of hope to the very end.

Physicians' Reactions to Cancer Patients. In many cases, the physician's withholding of the truth about cancer in large part must stem from himself. The physician's personality determines to a large extent the manner in which the diagnosis is presented, the ease with which the patient will

be able to discuss his feelings, and the feeling the patient senses as to the availability of his physician to him in future times of need.

Ideally, the physician should be humane, gentle, understanding, and consistently constructive in his selection of facts and words for the purpose of communicating usable knowledge about cancer to both the patient and the family. He should not be unduly pessimistic nor optimistic. He should not hold out false hope, yet he should be careful to verbalize clearly every fact which lends hope.

If every physician could fit this description and feel comfortable in such a discussion, one big factor for not telling a patient he has cancer would be removed. All physicians, however, bring along their own weaknesses, anxieties, and measures to dilute reality. All are threatened in varying degrees by the emotional distress associated with the situation. Anxiety has the property of contagion.

There is no question but that the situation makes terrific demands on the physician's emotions. Often, the physician unconsciously elects to tell those patients who will make little demand on his energies. When the physician decides not to tell a patient, usually it is for the sake of his own peace of mind. This is often rationalized as being for the good of the patient.

The direction of therapeutic interest in the cancer patient is in the creation of an atmosphere which can diminish anxiety. Talking about feelings is to be recommended above everything else. A frank discussion of the terror and fears which surround the diagnosis of cancer is the most effective solvent for anxiety. Thus, justifiable concerns can be sorted from irrational ones. Too, there is a quality of intimacy that attends this sharing process—it is the best tranquilizer there is.

Telling the Family. Most physicians would agree that the patient's family must be told regardless of what is said to the patient. Too often, however, it is left to the family to decide whether or not the patient should be told; many physicians respond to pressure from the family and do not discuss the situation with the patient. The family has reasons similar to those of the physician for avoiding telling the patient that he has cancer. However, when the physician has convinced the family that it would be in the patient's best interest to be fully aware of the situation, the family has been most appreciative of the final results.

Reasons for Telling the Patient. Although perhaps of minimal importance, the patient has a legal right to the truth about his condition. Almost all patients who have been questioned have wanted to know the truth. Another reason is that patients who have cancers which are cured should know what they had so that they can encourage other people and help combat the myth of the incurability of cancer. Furthermore, patients who know what they have are apt to be much more cooperative in follow-up care and treatment. To attempt to deny the obvious in instances of radical or mutilating surgery may actually intensify cancer patients' anxiety by making them feel that the truth

is too terrible to be mentioned. A last obvious factor is that patients are entitled to know if their life span is limited so that they can arrange their affairs and do the things they may want or need to do.

Justifiable Reasons to Withhold Truth. The patient who avoids mention of even the idea of cancer or who recoils fearfully from the possibility that he may have it is showing defensive tendencies toward denial which are of such a strong nature at times that they should be respected in the interest of his mental equilibrium. One also must recognize that a patient may require time to face a catastrophic threat of this kind. In addition, if the patient's history provides evidence of severe emotional and mental breaks, such as repeated depressions or paranoid and schizophrenic episodes, it is best that he not be told the truth directly. Sometimes, however, with a paranoid suspicious patient, avoidance of the truth and evasiveness reinforce his paranoid position, often making the situation somewhat untenable.

Lastly, it is perhaps a good idea for physicians who themselves have a horror of cancer, either consciously or unconsciously, not to try to discuss this diagnosis with a patient as it cannot but adversely affect the manner in which they communicate the information about cancer to the patient.

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Watch Your English, Please!

Arthur C. DeGraff. Editorial, Watch Your English, Please! GP 22: 81, November 1960.

The results of poor basic training in grade and high schools in spelling, grammar, and syntax are now quite evident in medical reports, manuscripts, and even in presentations at staff conferences. Nouns are cruelly twisted into newly coined verbs in a manner such as a psychiatrist did recently when he derived the verb "parentify" from the noun "parent." Adjectives are used as adverbs. The influence of the advertising profession is quite evident in the increasing use of the incomplete comparative. Radio and television help to emphasize poor grammar. Tenses are mixed in a confusing manner. The adverb "well" is almost forgotten. "Good" is used as both an adjective and as an adverb. Patients do not receive anticoagulant therapy, they are "anticoagulated"—a term which suggests that they had previously been coagulated. It is the patient who fibrillates, not the auricles. The liver may be described as "three fingered." There is edema of the "lower legs"! The lungs are described as showing no pathology, and blood chemistries are drawn from the patient. It is the patient who is "nauseous," not the drug. The term electrocardiograph is used for both the machine and the tracing taken by its use.

The fondness for abbreviations has produced some startling results. "SOB" in medicine no longer has the same strong connotation used by a former

president in his description of a well-known news commentator. Now it means "shortness of breath." The term "PTA" brings up painful memories of sessions with our children's teachers—in the newer practice of medicine it means simply "prior to admission."

Spelling is almost a lost art. Not so long ago, on a fourth-year examination in medicine at one of our top medical colleges, the word medicine was spelled four different ways on the covers of the examination books. On a hospital chart, history was recently found spelled "hystory"; murmurs became "murmurs"; fluoroscope is often written "fluroscope." Errors in spelling cannot be excused as the fault of the typist because it is the physician's responsibility to make final corrections on letters or manuscripts.

Physicians are presumably educated people who should be able to express themselves clearly in good English. A poor presentation at a staff conference or a badly written paper is often the result of plain carelessness, inadequate preparation of material, or poor organization. It is possible for any physician to write clearly and concisely. The simple rules of grammar taught in grade school, plus what was learned in writing freshman themes in college, should suffice. Perhaps those who are somewhat rusty should dust off their old books on English composition and spend a little time on review. We should consider our language as a tool which must be kept sharp at all times for ready use.

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IN MEMORIAM

Randolph, Hubert E. CWO USN (Ret)	
U.S. Naval Hospital, San Diego, Calif.	19 October
Petrey, Caleb C. LCDR MSC USN (Ret)	
Washington, D. C.	23 October
Thompson, Edgar (n) CAPT MC USN (Ret)	
Cleveland, Ohio	9 November
Ryan, Eunice A. LTJG NC USN (Ret)	
Long Beach, Calif.	21 November
Lloyd, Donald E. CDR MC USN	
Merizo Village, Guam, M. I.	11 December
Hoyle, Pearla W. LTJG NC USN (Ret)	
U.S. Naval Hospital, San Diego, Calif.	11 December

* * * * *

Everywhere in life, the true question is not what we gain, but what we do.

—Thomas Carlyle

Regional Hospitals

As further implementation of one aspect of "unification" of the services, the Department of Defense has designated 16 Naval hospitals as regional hospitals to act as an echelon of treatment for small stations, regardless of the service, that may lack a capability to provide full medical and surgical coverage. These hospitals will furnish specialized services and facilities for the various "satellite" stations in their geographic vicinity. Included in the list announced by the Defense Department are various Army and Air Force hospitals which, in turn, will act to provide similar services to small Naval stations and facilities in their areas. Therefore, all of the Armed Forces stations regardless of size will have available in their vicinity some service facility which will serve as a referral hospital and hospitalization center for long term cases. The list of regional hospitals is an extension of a practice presently in effect on a smaller scale and designates a larger number of such hospitals than has heretofore been used by the three services.

Instead of joint staffing, which has been the case in some medical facilities providing a joint service, the new system will continue to assure the best of medical attention to all service personnel and their dependents. It is expected to obviate costly duplication of medical facilities and personnel. By adequate staffing and utilization of regional hospitals, specialty trained personnel can be better utilized full time. Furthermore, teaching programs in the larger hospitals will be improved as a result of a larger number of referrals from the smaller medical facilities.

It is not intended that satellite medical facilities would be reduced to a point of marginal operation as long as a requirement for hospital coverage at the installation still exists. Neither is mass movement of patients between hospitals anticipated.

According to the plan, the Naval Hospital, Portsmouth, N.H., will serve as the regional hospital for Pease and Grenier Air Force Base, as well as the Naval Air Station, Brunswick, Me. Similarly, the hospital at St. Albans will serve Mitchell Air Force Base, the Army Hospital at Fort Jay, N.Y., the Naval Supply Depot at Bayonne, N.J., and other military elements in the greater New York area; and the Station Hospital, Port Hueneme, Calif., will serve Oxnard Air Force Base in addition to the Naval Air Station and the U.S. Naval Missile Test Center, Point Mugu. Reciprocating will be such facilities as the Army Hospital, Fort Ord, Calif., which will serve the Naval Air Station and Post Graduate School at Monterey.

Specific features of this provision are presented in Department of Defense Instruction, 6015.15, 2 September 1960, and promulgated within the Navy by BuMed Instruction 6320.30, 10 October 1960.

* * * * *

Board Certifications - Active DutyAmerican Board of Dermatology

LCDR William J. Wagner MC USN

American Board of Ophthalmology

LT Elmer C. Collins MC USNR

American Board of Pathology

LT James A. Harshman MC USNR

LT Benjamin T. Williams MC USNR

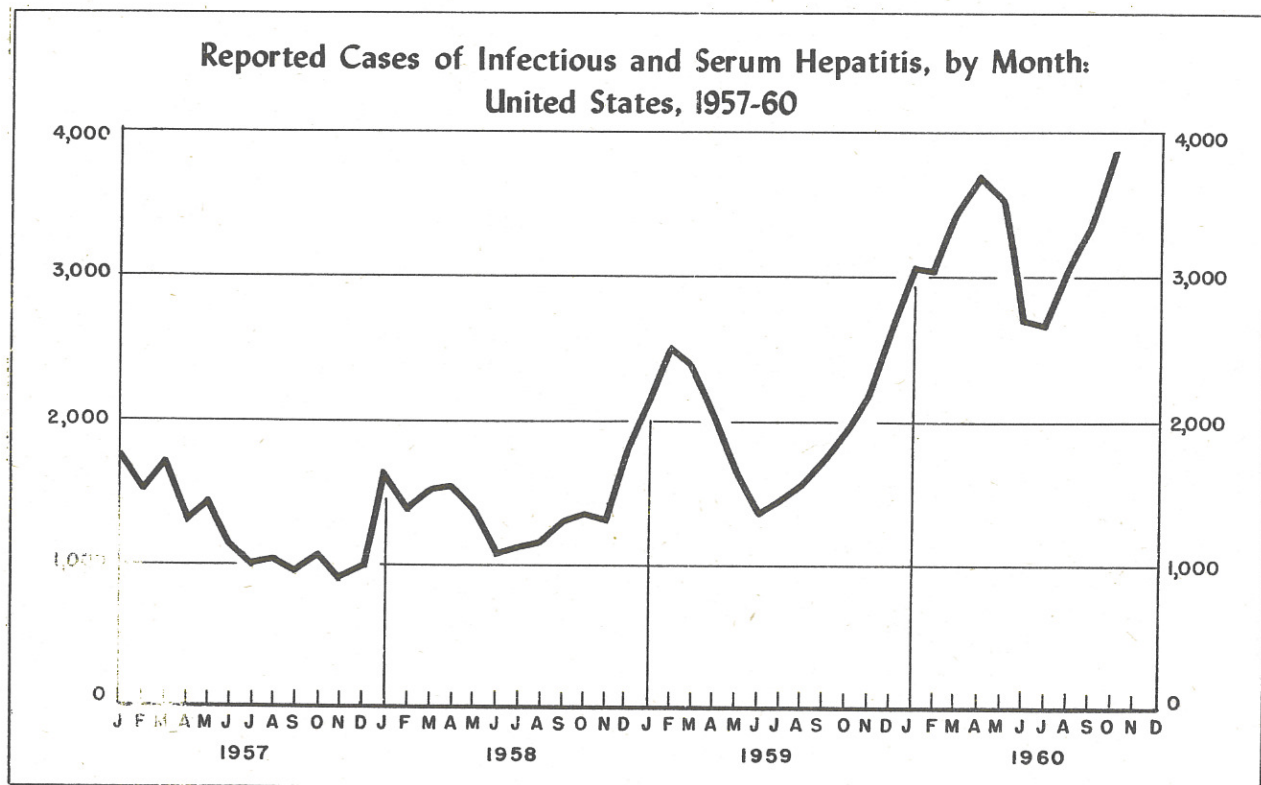
American Board of Pediatrics

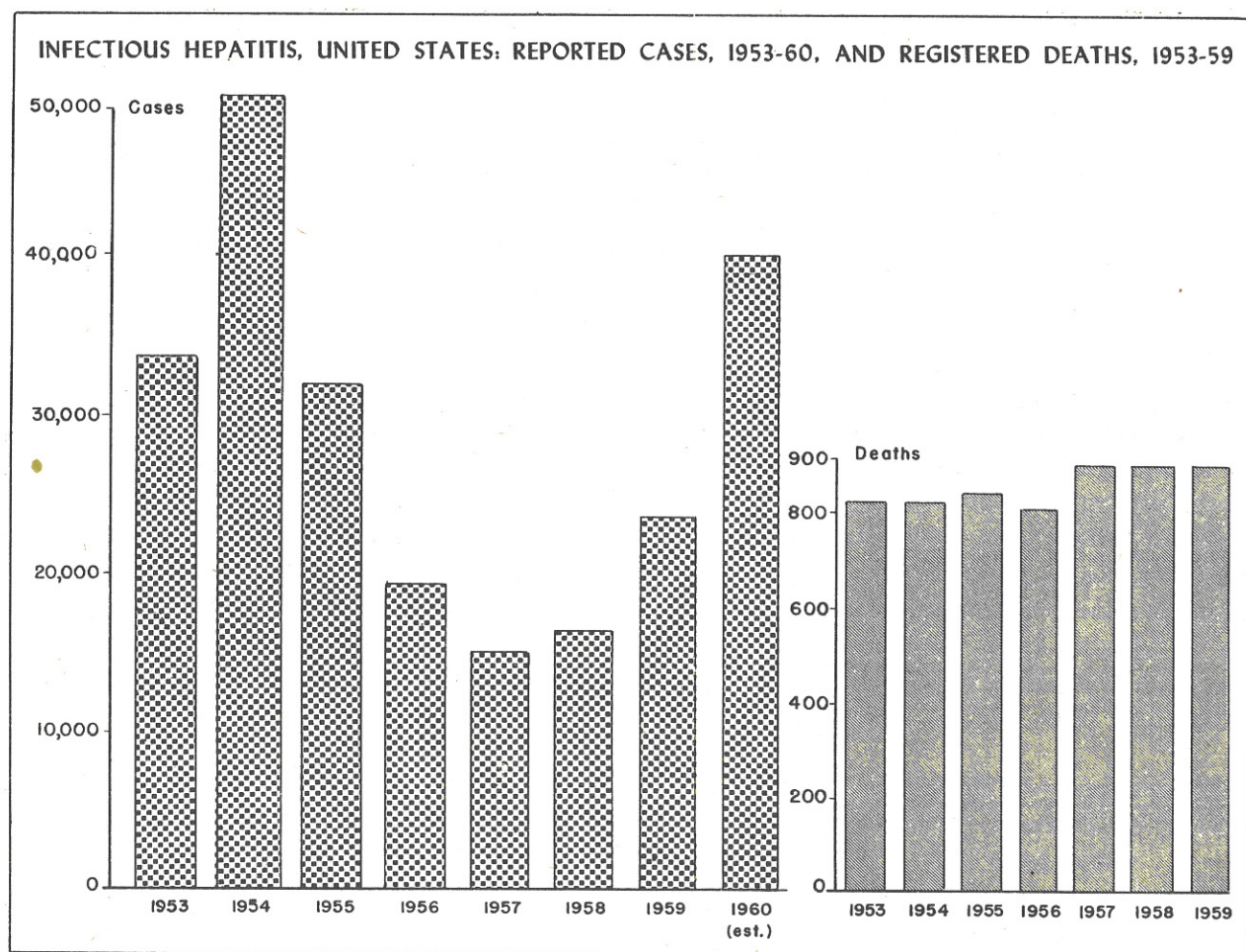
LT Daniel Shuptar MC USN

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Hepatitis on the Increase

Graphs presented in Morbidity and Mortality, a weekly report of the Public Health Service, show a continuing trend of the increase of occurrence of infectious and serum hepatitis in the United States during recent months,





as well as a general increase during the last few years. The graph showing the occurrence of reported cases by month during 1957-60 demonstrates the continuous rise of both types of hepatitis (12 November 1960). The peak year for infectious hepatitis within the last decade was 1954 when there were over 50,000 cases reported. The estimate for 1960, by far the highest in the last 5 years, is expected to be only about 10,000 lower than the previous high (2 December 1960). Despite the wide range in the number of cases during recent years, the number of deaths from infectious hepatitis has remained relatively constant.

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BUMED INSTRUCTION 6270.3 CHANGE TRANSMITTAL 13 December 1960

Subj: CH-3 to BuMed Instruction 6270.3, Subj: Threshold limit values for toxic materials

This change presents a number of modifications and additions to the list previously issued, and incorporates revisions established by the American Conference of Governmental Industrial Hygienists.

From the Note Book

Credit Line Revised. Considering that readers might be interested in obtaining reprints of some of the major abstracts and condensations of professional articles appearing in the Medical News Letter, and recognizing that many readers might not have recourse to the original source of the article, information will hereafter be presented in the credit line enabling readers to write directly to the author for reprints or tear sheets. The address given is that of the senior author of the article.

Surgeon General Commends Portuguese Naval Hospital. A letter of appreciation from the Surgeon General of the Navy, RADM B. W. Hogan, has been presented to the Director of the Portuguese Naval Hospital at Lisbon, in recognition of outstanding services performed by members of the hospital staff in treating an accidentally injured American sailor early this year. While walking along a Portuguese submarine at the time an explosion took place aboard a nearby Portuguese coastal boat, the sailor suffered burns about the face, hands, legs, and respiratory tract. He was rushed to the hospital where a well-trained Portuguese medical team treated him and ultimately saved his life. (TIO, BuMed)

Retirements—1 December 1960

CAPT William H. Druckemiller MC USN, after more than 20 years active duty; last duty, U. S. Naval Hospital, NNMC, Bethesda, Md.

CAPT James L. Fuelling MC USN, after more than 20 years active duty; last duty, U. S. Naval School of Aviation Medicine, Pensacola, Fla.

Long Beach Hospital in Budget for '62. According to present information, the proposed new Naval Hospital, Long Beach, Calif., is in the Military Construction Budget for Fiscal Year 1962. Plans provide for a 500-bed hospital to cost approximately \$9.2 million.

CAPT Nadbath Addresses LA Society. CAPT Rudolph P. Nadbath MC USN, U. S. Navy Hospital, San Diego, recently addressed the Los Angeles Society of Ophthalmology and Otolaryngology, discussing Office Practice in the Fitting of Contact Lenses.

Drive-in Inoculation Station. Medical Department personnel at the Naval Air Station, Memphis, Tenn., have kept pace with a faster Navy with the innovation of a drive-in inoculation station that is probably the first in any of the services. When response to the annual call for all-hands influenza inoculations was poor, the dispensary personnel set up shop in a covered ambulance ramp. The arrangement was an overwhelming success; thousands availed themselves of the new service that eliminated long waiting lines and the search

for a parking space. As many as 700 persons an hour could be accommodated. One pleased sailor said: "Man, this doesn't take away any of the needle pain, but at least the ordeal is easier . . . and you can get away quicker." (NavNews)

Thrombolytic Therapy for Coronary Heart Disease. A medical approach, currently receiving considerable attention, involves use of thrombolytic or clot-dissolving agents and is aimed at enzymatic lysis of fibrin, the major insoluble fibrous protein of the clot. On the basis of experimental observations, such an approach seems entirely feasible and the authors briefly review the progress made toward the achievement of this goal. It will be apparent that therapeutic methods useful in coronary artery thrombosis are still in the early stages of development, but concepts and methods of real promise are emerging. (A. Fletcher, S. Sherry, *Circulation*, October 1960)

Serum Complement Levels in LE and Nephritis. In 245 out of 246 cases of acute glomerulonephritis, serum complement levels were markedly lowered. Complement level returned to normal in most cases at approximately the time when healing occurred; persistence of low complement levels seemed to indicate a poor prognosis with rapid decline of kidney function and death. Complement levels were also significantly altered in cases of pure nephrosis and other nephrotic syndromes as well as in patients with active lupus erythematosus disseminatus. The fall of complement level is assumed to be due to a binding of complement in an antigen-antibody reaction. (K. Lange, et al, *Ann Int Med*, October 1960)

Effects of Acute Central Nervous System Arousal. Measurements of plasma free fatty acid (FFA) and glucose levels, urinary excretion of adrenaline and noradrenaline, heart rate, and blood pressure were made in 20 students undergoing a major 15-minute scholastic examination and on non-test days. Increase in plasma FFA and glucose, urinary excretion of adrenaline, and heart rate was noted and correlated with arousal of affect. The acute changes noted suggest that lipolysis may be a companion process to glycogenolysis as part of the organism's response to arousal. (M. Bogdonoff, et al, *J Clin Endocr*, October 1960)

Aldosterone Excretion in Essential Hypertension. A study was made of the incidence of primary aldosteronism in patients with hypertension. Results showed that about 25% of the patients with essential hypertension in the study had significantly elevated levels of urinary aldosterone, but they did not exhibit the abnormal serum electrolyte changes seen in primary aldosteronism. The significance of increased urinary aldosterone in hypertension remains to be determined. (J. Garst, et al, *J Clin Endocr*, October 1960)

Fluorescein String Test. In contrast to another report referred to in a Note Book item recently (22 July 1960), the present authors demonstrated accurate localization of the site of bleeding by use of the fluorescein string test. They point out that not only does it permit rapid and precise location of the bleeding site, but also makes it possible to determine whether or not active bleeding is occurring in the upper gastrointestinal tract at the time the test is performed. (W. Haynes Jr, et al, Surgery, November 1960)

Gamma Globulin in Staphylococcal Infections. Several workers have reported that human gamma globulin, given parenterally, has a favorable effect on the course of staphylococcal disease. However, from laboratory studies, the authors showed that systemic administration of gamma globulin was ineffective in modifying the development of local staphylococcal lesions in the skin of guinea pigs and did not prolong the period of time during which an antibiotic could affect the course of these lesions. (H. Lambert, J Lab Clin Med, November 1960)

Effectiveness of Colistin. In detailed study of 44 patients with infections due to gram-negative bacteria, and conspicuous complicating factors, treatment with the antibiotic, colistin, achieved bacteriologically proven improvement in 67% of cases. This polypeptide appeared to be safe, and except for a low incidence of minor side effects, was well tolerated. The particular usefulness of colistin appears to be for infections due to *Pseudomonas* species; however, a distinct role in treatment of *E. coli*, *Klebsiella*, and *Paracolon* infections refractory to other therapy is suggested. (J. Hall, Amer J Med Sci, November 1960)

Capacidin - A New Antibiotic. A new member of the group of antibiotics produced by species of *Streptomyces* and having a conjugated polyene system in their structure, is described. It has strong activity against a wide variety of fungi, saprophytic and pathogenic. The agent also exhibits activity against some of the gram-positive bacteria but not against gram-negative bacteria. (R. Brown, E. Hazen, Antibiot Chemother, November 1960)

Blood Loss in Subjects Taking Aspirin. Frequent occult gastrointestinal bleeding in subjects taking aspirin has been suggested. The author investigated the extent of blood loss by means of a radioactive chromium⁵¹ method. Of the subjects, 69% were considered to be losing blood while they were taking 2.6 gm of aspirin in divided doses daily, and 17% lost more than 6 ml. Loss of blood was not related to sex or age of the subjects, hematologic changes, salicylate level, or gastric symptoms. This suggests that alimentary bleeding represents a frequent side effect of aspirin therapy, and in some patients, chronic ingestion of salicylates may be accompanied by sufficient blood loss to induce iron deficiency over a prolonged period. (P. Holt, J Lab Clin Med, November 1960)

Recent Research ReportsU. S. Naval Medical Research Unit No. 4 (Dental), Naval Training Center,
Great Lakes, Ill.

1. Salivary Microbial Changes as a Result of Full Mouth Extraction. MR 005.12-5004, June 1960.
2. Isolation of Pleuropneumonia-Like Organisms from the Oral Cavity. MR 005.12-5004, June 1960.
3. Blood Serum Total 17-Hydroxycorticoid Levels in Necrotizing Ulcerative Gingivitis. MR 005.12-5102, June 1960.
4. Rate of Flow of Constantly Stimulated Parotid Secretion in Caries Free and Caries Rampant Groups. MR 005.12-5102, June 1960.

U. S. Naval Medical Research Laboratory, U. S. Naval Submarine Base,
New London, Conn.

1. Airborne Condensation Droplets and Ions as Health Factors in Closed Spaces. MR 005.14-3300, Report No. 1, Subtask No. 5, 20 September '60.
2. Experiences with Submarine Atmospheres, Report No. 322, MR 005.14-3300-5.02, 17 October 1960.

U. S. Naval School of Aviation Medicine, Naval Air Station, Pensacola, Fla.

1. A Device for the Humidification of Inspired Dry Oxygen and the Conservation of Breathing Oxygen. MR 500.13-3100, Subtask No. 6, Report No. 2, 27 April 1960.
2. Gentling and Altitude Tolerance. MR 005.15-2001, Subtask No. 3, Report No. 3, 28 April 1960.
3. Further Evaluation of Tissue Depth Doses in Proton Radiation Fields in Space. MR 005.13-1002, Subtask No. 1, Report No. 17, 24 May 1960.
4. Measuring Training Progress, MR 005.13-5001, Report No. 2, Subtask No. 8, 1 June 1960.
5. Human Performance During Adaptation to Stress in the Pensacola Slow Rotation Room. MR 005.13-6001, Report No. 52, Subtask No. 1, 23 June 1960.
6. Problems of Nitrogen-Free and Carbon-Dioxide-Rich Extraterrestrial Atmospheres. MR 005.13-3100, Report No. 3, Subtask 4, 7 July 1960.
7. Symptoms Resulting from Prolonged Immersion in Water: The Problem of Zero G Asthenia. MR 005.15-2001, Report No. 4, Subtask 1, 15 July 1960.
8. Adaptation of Bizarre Stimulation of the Semicircular Canals as Indicated by the Oculogyral Illusion. MR 005.13-6001, Report No. 53, Subtask No. 1, 27 July 1960.
9. Inhibition of Cholesterol Induced Atherogenesis in Chickens. MR 005.13-7004, Report No. 10, Subtask No. 3, 31 July 1960.

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DENTAL**SECTION**Dimensional Stability of Rubber Base Impressions

Richard J. Schnell and Ralph W. Phillips, Indiana University School of Dentistry, Indianapolis, Ind. Dimensional Stability of Rubber Base Impressions and Certain Other Factors Affecting Accuracy. J Amer Dent Assn 57: 39-48, July 1958.

Five brands of rubber base impression materials—Coe-Flex, Form-Flex, Permlastic, heavy body Permlastic, and Sta-Tic—were studied to determine their dimensional stability on storage and the effect of certain other variables which influence their accuracy. Over 700 impressions were studied. A Bureau of Standards steel die and a series of four multiple-cavity preparations were used. The following conclusions were reached:

1. None of the rubber base materials tested was dimensionally stable. The distortion probably can be associated with continued curing of the material. Distortion, however, at any time interval was less than with reversible hydrocolloid.

2. Distortion was not significantly affected by the storage environment. Storage in water should not be employed when a plastic tray or shell is used.

3. Use of the double mix procedure increases the initial accuracy of the impression and reduces the distortion during storage.

4. When a band impression is taken with a single mix of material, accuracy decreases as the thickness of the surrounding rubber base is increased.

5. The bulk of the material is less critical when the double mix technic is used.

6. Bubbles in the impression are minimized by the use of a syringe and double mix procedure.

7. Uneven distribution of impression material around the tooth increases distortion.

8. Successive dies may be poured in one impression with no greater distortion than storage of the unpoured impression for a comparable period.

9. When brands tested were used properly, little difference was detected in their accuracy. Selection probably will be based on handling characteristics.

10. For indirect technics involving single or multiple preparations and short-span bridges, the rubber base impression materials are comparable in accuracy to the better reversible hydrocolloids. Long-span or complex bridges were not studied, but no reason is known to contra-indicate the use of this type of material in such instances.

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Subgingival Root Planing

Prior to extraction, 90 teeth were planed subgingivally; 30 with hoes, 30 with files, and 30 with curettes. The curettes produced the smoothest surfaces and the files the roughest surfaces. The curettes and hoes were the most efficient in removing calculus and the files the least efficient. When calculus remained after subgingival planing, it was found most frequently on either the mesial or distal surface. The surfaces most frequently devoid of calculus were the line angles mesial and distal to the labial and buccal surfaces. Although calculus was sometimes planed smooth to the sense of touch, it produced a different sound with the explorer than the adjacent smooth tooth surfaces. (Jerry E. Barnes and Erwin M. Schaffer. Subgingival Root Planing. J Periodont 31:300-303, September 1960.)

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Physicians Vs Doctor Vs Professor

R. E. Stowell MD, Scientific Director, Armed Forces Institute of Pathology, Washington 25, D. C. Physicians Vs Doctor Vs Professor. The Bulletin of the College of American Pathologists 14: 155, December 1960.

The term doctor, derived from the Latin word for teacher, has many different meanings. Diverse definitions in dictionaries include: (1) a teacher, a learned man; (2) an advanced academic title; (3) a licensed practitioner of medicine; (4) a wizard or medicine-man in a savage tribe; (5) a loaded die; (6) a brightly colored artificial fly; and (7) a makeshift mechanical contrivance for remedying a difficulty.

In many other countries, the practitioner of medicine has a title equivalent to that of physician or licentiate to practice, and the academic degree Doctor of Medicine is awarded to a select few after several years of advanced academic studies beyond that required to practice medicine. In former years, those of our schools that awarded degrees of Doctor of Medicine after 4 or less years of study must indeed have seemed like diploma mills to some foreign doctors of medicine. Yet now many state licensing boards refuse to recognize graduates of foreign schools of highest caliber whose degree of

Doctor of Medicine is the approximate equivalent of a combined M.D. and Ph. D. degree in this country. Some organized medical groups are bringing increasing pressure to discourage holders of doctorate degrees in fields other than medicine from using the title doctor. Dentists certainly are not impressed by the reference to "doctors and dentists." Some physical scientists retaliate with "Is he a physician or a scientist?"

Should learned professors in this country who train many for doctorate degrees in fields other than medicine not be addressed as Doctor? In contrast to many other countries where the title of professor is most highly regarded by the general population, in the United States, unfortunately, many regard it as a joke. By some, the egghead is deemed a "sucker" who doesn't have enough sense to capitalize fully upon his potential earnings. Isn't there some confusion of values and meanings of these titles? As physicians, we should recognize that in many other fields besides medicine, academic degrees of doctor are given and that we should extend to the holders of these degrees the same courtesy of title which we expect for our own. Regardless of the extent to which we practice, investigate, or instruct, we should conduct ourselves as learned men, teachers, and scientists in the highest tradition of the academic title of Doctor.

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High Edentulous Rate

A recent report of the National Health survey based on 1957 - 1959 interviews, shows that 22 million men and women of all ages have lost all permanent teeth. The number constitutes 13% of the population; no figures were given on how many of the group wear dentures. The report breakdown showed that 2 out of 3 persons over 75 are without teeth; while in the 15 to 24 age bracket, the figure is 1%. Thirty percent of white persons aged 45 to 64 are edentulous, and 17% of nonwhite persons. Sixty-two percent of persons 65 or more in the under \$2000 income bracket are edentulous, compared with 55% in families with over \$7000 annual income. (American Dental Association News Letter 13: 20, November 15, 1960)

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New Initial Outfitting Lists

New initial outfitting lists of cognizance symbol "L" dental material have been distributed to all commissioned ships having dental personnel attached. These lists are effective as of 1 November 1960, and supersede and cancel lists dated January 1959. Significant changes will be published as considered necessary by Chief, Field Branch, Bureau of Medicine and Surgery.

Rear Admiral Ryan Retires

RADM Daniel W. Ryan DC USN, former Assistant Chief of the Bureau of Medicine and Surgery (Dentistry), and Chief, Dental Division, closed a colorful career of more than 35 years of active service on 1 December 1960. Upon retirement, the Surgeon General of the Navy, RADM B. W. Hogan, awarded ADM Ryan a "Certificate of Merit" for exceptional meritorious service to the Government. Previously, he had been awarded the Republic of Panama Order De Vasco De Balboa in the rank of Commander.

ADM Ryan was born in Manchester, Iowa on 22 November 1899, and attended Coe College and the University of Iowa. He obtained his dental degree from the University of Denver in 1923 and maintained a private practice in Aurora, Colo., prior to entering the Navy in 1925. His Naval career which began at the Naval Training Station, Hampton Roads, Va., included many ships and stations. Among the ships, he served on board the USS LUZON, USS LEXINGTON, USS RELIEF, and the USS RIGEL. He also had tours of duty in China and at Cavite in the Philippine Islands.

ADM Ryan served as Senior Dental Officer at the Marine Barracks, Camp Elliott, Calif., and at the Marine Corps Base, San Diego, Calif., where he received a Secretary of the Navy Commendation with ribbon for services during the period 1942 - 1945. He also served as Senior Dental Officer at the Dispensary in the Navy Department and at the Naval Academy. Immediately prior to retirement he was the District Dental Officer, Ninth Naval District, Great Lakes, Ill.

Among various organizations to which ADM Ryan belongs are Kappa Sigma, Delta Sigma Delta, Omicron Kappa Upsilon, and the American Dental Association; he is a Fellow of both the American and the International College of Dentists.

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Personnel and Professional Notes

CAPT Frechette Presents Lectures. CAPT A. R. Frechette DC USN, Deputy Chief of the Dental Division, Bureau of Medicine and Surgery, recently presented a 5-hour lecture program on prosthodontics before the Winnipeg Dental Society, Winnipeg, Manitoba, Canada. The subjects discussed were "Improved Partial Dentures" and "Prosthetic Appliances Associated with Abnormal Jaw Relations." At the invitation of Dean J. W. Neilson, Faculty of Dentistry, University of Manitoba, CAPT Frechette lectured also to the junior class of the dental school on the subject "Partial Denture Planning and Design."

CAPT Stone Elected to Academy. CAPT Arthur Stone DC USNR, currently on duty at the Boston Naval Shipyard, was recently elected as Associate Member of the American Academy of Periodontology.

Dr. W.J. Updegrave Presents Lecture at NDS. Dr. William J. Updegrave, noted author and lecturer, and Professor of Dental Roentgenography at Temple University School of Dentistry, Philadelphia, Pa., lectured before Dental officers of the Armed Forces, civilian dentists, and other scientific personnel of the Washington, D. C. area on 18 November 1960 as a part of the special lecture series presented by the U.S. Naval Dental School. In the lecture—The Dental Approach to the Temporomandibular Joint Program—Dr. Updegrave stressed the responsibility of the dentist to diagnose and treat minor symptoms of temporomandibular joint dysfunction which might lead to major joint problems if untreated. In addition, at an informal seminar, he demonstrated a simplified technic for producing higher fidelity in dental radiographs.

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RESERVE



SECTION

Officer Promotion Policy Revised

Recent changes in law have modified requirements and regulations governing the promotion of Reserve officers. A few points to keep in mind for present and future planning are:

Eligibility for consideration by FY 1962 selection boards. Reserve officers (except nurses) in an active status (either Ready Reserve or Standby Reserve, S-1) become eligible for consideration for promotion when their running mates are in or above a promotion zone. In addition, for consideration by FY 1962 selection boards, officers must earn an average of 12 promotion points for each year in grade before the beginning of the fiscal year in which they will be in the established promotion zone or otherwise eligible for consideration. These points are computed from 1 July following date of rank (or from date of rank if it is 1 July) to 30 June of the fiscal year preceding the fiscal year in which the officer is in the established promotion zone. In no instance will more than 72 points be required.

Professional qualification if selected, commencing FY 1962. Officers must earn an average of 24 promotion points for each year in grade—computed from the 1 July following the date of rank (or date of rank if it is 1 July) including the fiscal year in which selected for promotion. In no instance will more than 144 points be required. If an officer fails to establish the prescribed number of promotion points before the end of the fiscal year following the fiscal

year in which he was recommended for promotion, he shall not be considered professionally qualified for promotion after that date. In other words, officers have only one fiscal year after selection in which to qualify professionally for promotion.

Crediting residency training. Officers on a promotion list must establish their professional qualifications before the terminal date described above. Those who wish to have promotion points credited for residency training must request credit for this training before the terminal date in order to establish their professional qualifications. The purely mechanical process of recording promotion points for residency training by the Reserve Officers Recording Activity (RORA) has no effect on the "establishment" of professional qualifications, even though these courses provide the required number of promotion points. Thus, officers, who are on a promotion list and who fail to request credit for previous residency training before the terminal date to establish professional qualifications, have not established their professional qualifications as required by SecNav regulations.

Pay and allowances. A Naval Reserve officer is entitled to the pay and allowances of the grade to which he is promoted for duty performed from his date of rank. However, a recent change in the law provides that if an officer has not established his professional and moral qualifications, as prescribed by SecNav, within one year after the date on which the President approved the report of the selection board that recommended the officer for promotion, he is entitled to the pay and allowances of the grade to which promoted only from the date he is appointed in that grade—that is, on the date SecNav signs the appointment.

Officers on the ISL. Another change in the promotion law provides that any Reserve officer (O-2 and above) who has been on the Inactive Status List (ISL) may not be considered for promotion until at least one year after the date he is returned to an active status. However, he will not be considered as having failed of selection. For example: If a line commander had been removed from the ISL on 1 February 1960, his name would not be presented to the fiscal year 1961 selection board since it is scheduled to convene on 4 January 1961. If otherwise eligible, he would be considered by a Fiscal Year 1962 selection board and will not be considered as having been passed over by the FY 1961 board.

Transfer to ISL cancels selection. A Reserve officer who is recommended for promotion by a selection board and who, at the time he would otherwise be promoted, is ineligible for promotion because he has been transferred to the Inactive Status List, shall be treated as if he had not been considered for promotion by the selection board that last considered him. If he is later returned to an active status, his name may not be placed on a promotion list until he is considered by another selection board and is recommended for promotion in the approved report of that board. This law applies to all officers regardless of the reason for transfer to the ISL. (The Naval Reservist, November 1960)

Military Medical Training Course

During the period, 12 - 25 March 1961 inclusive, the U. S. Naval Medical School, National Naval Medical Center, Bethesda, Md., will again sponsor a course—Military Medical Training—for Reserve Medical, Dental, Medical Service, and Nurse Corps officers of the U. S. Navy, Army, Air Force, and Public Health Service. The course will include a liberal amount of material on Management of Mass Casualties and Medical Aspects of Thermonuclear, Biologic, and Chemical Warfare Disaster Control. Other features will be the effect of extremes of environment upon military operations on a worldwide basis. Security clearance is NOT required.

Quotas have been allocated to the Commandants of the 1st, 3rd, 4th, 5th, 6th, 8th, and 9th Naval Districts and to the Chief, Naval Air Reserve Training. Interested eligible inactive Naval Reserve Medical Department officers should request this training course from their respective administrative commanders.

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OCCUPATIONAL MEDICINE

Ice Water as Primary Treatment of Burns

Alex G. Shulman, 6333 Wilshire Blvd., Los Angeles, Calif. Ice Water as Primary Treatment of Burns: Simple Method of Emergency Treatment of Burns to Alleviate Pain, Reduce Sequelae, and Hasten Healing. JAMA 173: 96-99, August 27, 1960.

Although scattered references in the literature are unanimous in praise of use of ice water as primary treatment of burns, it is not generally used today.

One hundred and fifty patients, predominantly male, ranging in age from 17 to 66 years with burns of all degrees, but of areas of less than 20% of total body surface, have been treated by the initial immersion of the part in ice water or the application of ice-cold moist towels to the part. Whereas, most of the burns were of thermal origin, chemical and electrical burns have been treated in the same manner. The treatment was begun originally as an

emergency measure to provide immediate alleviation of pain, but the effect on the burn seemed in most instances to have lessened the damaging sequelae expected. Therefore, it would seem that the basic pathologic process and the ensuing chain of events appear to be altered or stopped.

The burned area is immersed immediately into a large basin or other vessel of cold water to which ice cubes and hexachlorophene (pHisoHex) are added. Where this is impractical—as in the case of burns of the head and neck, shoulder, chest, abdominal wall, or back—cold wet towels which are kept in a bucket of ice water are applied to the burn areas.

The term "ice water" refers to tap water to which ice cubes have been added. The ice cubes melt quickly, depending on the extent of the body surface immersed in the water and on the room temperature, and must be continuously replaced.

The time factor between injury and treatment determines the result. This treatment should, therefore, be initiated if possible by the patient or first-aid attendant at once.

Those patients who come in already bandaged should have their dressings soaked off under ice water as quickly as possible. It is believed that the combination of the low temperature, the bactericidal effect of the hexachlorophene, and the mechanical cleansing by the water serves to inhibit bacterial growth.

In every patient thus treated, immediate gratifying relief was expressed at once. In every instance, pain would return when the program was interrupted too soon. It has been learned that the cold treatment must be continued until it is possible to discontinue treatment without return of the pain. The time required may be from 30 minutes to as long as 5 hours.

After this initial management, minimal sterile debridement should be performed if absolutely necessary. Next, either the open-burn regimen for burns of the face or certain parts of the body should be followed; or the more conventional therapy of sterile fine-mesh petroleum jelly (Vaseline) gauze dressings may be applied if the patient is to return to work and is to be treated on an ambulant basis. Tetanus prophylaxis, antibiotic therapy, and electrolyte, water, and colloid replacement should follow when indicated.

To date, 150 patients with burns have been treated in the manner described. While most of the burns were of first-degree and second-degree severity and covered less than 20% of the body area, certain elements of third-degree burn were necessarily included.

No infections have been encountered in those patients treated within one hour of injury. Whereas pain ordinarily lasts 24 hours or more in the first-degree burn, relief in these patients was immediate and the pain was almost totally absent by the time the patient left the office 2 or 3 hours later. The total length of time under treatment and the number of office visits have been reduced to about one-third of that of patients treated otherwise.

The impression obtained from this experience is that, although the primary injurious effect of the burn has taken place, the usual inflammatory

process secondary to the burn can be reduced in degree; indeed, at times it can be reversed by ice-water therapy. The visible area of redness of the skin—an objective finding which can be measured—becomes obviously reduced in extent while the cold is applied and does not reappear later. This observation suggests an alteration in the pathologic state. It is logical to speculate that the lowered skin temperature would inhibit capillary engorgement and the resultant loss of fluids, and that the lowered metabolic requirements of the already damaged tissues would tend to preserve the viability of such tissues. Such observations seem to be confirmed by animal studies.

Generalized hypothermia, as it is presently used in certain surgical procedures, is known to carry with it certain dangers which stem from reduction of cardiac output, inadequate respiration, and increased cardiac irritability. It must be emphasized, however, that in this study no attempt was made to induce generalized hypothermia. The most severe burn cases in this group involved body areas of less than 20% of the total body surface.

Monitoring of oral temperatures revealed no lowering of such temperatures in almost all cases. Only in the occasional patient did the body temperature drop, and then to not less than 97.6 F (36.4 C).

While the value of this mode of therapy for patients with extensive burns in shock remains to be tested on a large scale, its merits for those with burns of lesser degree should not be doubted in the light of the above observations.

* * * * *

Plastic Cement Fumes

Solvent vapors are inhaled to induce an experience of fantasy in which pleasurable hallucinosis is prominent. Model airplane enthusiasts have been warned about the serious consequences of inhaling vapors from certain types of glue. It is impossible to assess the toxicity of a product without knowing the approximate concentration of the potentially toxic substances used in the formulation. Solvents in general are primarily narcotic agents. Sporadic reports of "jag" effects are based on the initial stimulant effect of these substances.

Chlorinated hydrocarbon solvents, such as carbon tetrachloride, chloroform, and trichloroethylene, are sometimes used in plastic cements. The practice of sniffing fumes of this type of solvent has been reported occasionally by industry and, inevitably, the more imaginative teen-agers also discover the exhilarating and intoxicating properties of these solvents. These materials are liver poisons and frequent inhalation of concentrations sufficient to cause a jag are decidedly harmful to this organ and may cause severe damage to the respiratory and circulatory systems. (Questions and Answers, JAMA 173: 1277, July 16, 1960)

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Gasoline Sniffing

Inhalation of high concentrations of gasoline may cause sudden loss of consciousness, coma, or even death. Lower concentrations may produce flushing of the face, followed by staggering gait, mental confusion, disorientation, ataxia, blurred speech, and difficulties in swallowing—a typical jag. After continued or repeated exposure to fairly high concentrations (chronic gasoline poisoning), the patient may lose his appetite and lose weight. He may look pale and suffer from nausea, headache, nervousness, neurasthenic manifestations, muscular weakness, and cramps. He may become dull and listless, lose his memory, become confused, suffer from analgesias, paresthesias, and myalgia, and may develop polyneuritis and anemia.

Persons vary greatly in their susceptibility to petroleum vapors not containing other poisonous components. About 0.3% of gasoline vapor in air will make a man dizzy in about 15 minutes. A man accustomed to breathing the vapors can endure large percentages, but 1 to 2% of gasoline vapor will make most men dizzy in 3 to 5 minutes; this percentage will endanger life if exposure is continued for one hour or more. (Questions and Answers, JAMA 173: 1276, July 16, 1960)

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New Extinguishing Agent Being Developed

A powerful new extinguishing agent for fires in jet fuels, gasoline, and other flammable liquids was demonstrated for the first time to the press recently at MacArthur Field, Ronkonkoma, L. I., N. Y. Although it is still in the development stage, the new dry chemical type agent is expected to have important fire extinguishing potential for air crash fires as well as in the petroleum, chemical, marine, and trucking industries. All suffer huge losses annually from fires caused by accidental ignition of volatile fuels.

The new agent is called Purple K partly because of the purple glow it gives on contact with flame. K is the chemical symbol for potassium; Purple K is actually potassium bicarbonate or KHCO_3 . It has been treated to make it free flowing, water repellent, and non-caking. Untreated potassium bicarbonate cakes readily. Purple K is non-toxic, non-corrosive, non-abrasive and does not freeze.

Purple K was developed for the Bureau of Weapons of the Navy Department. Development was initiated by the Naval Research Laboratory working closely with a number of fire extinguisher manufacturing companies.

The Navy has begun to equip its fire crash trucks with Purple K, although it is not yet commercially available to industry. Engineers point out that Purple K can be used with most dry chemical fire extinguishers. (Safety Maintenance 120: 48, October 1960)

Lead Poisoning - A Firing Range Peril

The hazard of lead poisoning exists for instructors and others who spend long periods of time at indoor firing ranges, such as used by the Canadian Royal Mounted Police, a survey recently completed revealed.

Researchers of the Department of National Health and Welfare in Ottawa found that individuals who worked more than 30 hours a week on the target practice ranges showed an average concentration of 76 micrograms of lead per liter of urine. Individuals who worked more than 120 hours the month before urinalysis showed an average of 97 micrograms. Those exposed to more than 1000 rounds of fired ammunition during the previous week averaged 56 micrograms, while those exposed to more than 5000 rounds the previous month averaged 72 micrograms.

Dr. T.H. Patterson, Chief, Occupational Health Division, DNHWS, said that the survey was sparked by diagnosis of lead poisoning in an instructor whose urine showed 1000 micrograms of lead per liter. The presence of coproporphyrin in the urine was also demonstrated.

Investigators also found the airborne lead concentrations on the ranges to be many times the maximum recommended as acceptable for continuous industrial exposure. It was noted that settled dust samples contained a substantial lead content. (World Wide Medical News Service Canadian Bureau: Scope Weekly, 19 October 1960)

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Pigments and Lacquers - Basic Ingredients in the Paint Industry

Modern painting operations require low-boiling, rapidly volatile, potent solvents with components for preventing formation of film, pigments, binding materials, solvents and thinners, adhesives, emulsifiers, and disinfectants. Solvents are usually mixtures of aliphatic and aromatic hydrocarbons; cyclohexane, methylcyclohexane, tetralin, decalin, alcohols, esters, and ethers; the nitroparaffins have now to some extent replaced the once ubiquitous turpentine. Glycol and furfuran derivatives are much used as lacquer solvents. Binding materials have undergone much development during the last 30 years with introduction of nitrocellulose lacquers and synthetic resins obtained by polymerization; isocyanates and epoxy compounds and silicones are the most recent examples of this development.

The main hazards from all these materials are summarized according to the processes in which they are used. Scraping of old paint involves inhalation of lead compounds and burning paint involves inhalation of zinc fumes and decomposition products such as acrolein. Paint stripping with alkalis causes skin contact and in stripping with mixed solvents, both skin

contact and inhalation occur. Sand blasting with quartz can cause silicosis. Chemical derusting and fluorizing bring contact with phosphoric and hydrofluoric acid and its salts. All methods of paint application involve inhalation of solvent vapors and volatile components; spraying carries the additional hazard of fine pigment particles, and hand cleansing with thinners, the risk of defatting the skin. (M. Hochweber. Industrial Hygiene Digest, July 1960)

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Toxicology of Methanol

E. V. Henson, Medical Director, Union Carbide Chemical Co., South Charleston, W. Va. The Toxicology of Some Aliphatic Alcohols, Part II. J Occup Med 2: 497-501, October 1960.

Methanol (methyl alcohol, wood alcohol, carbinol, CH_3OH) is a water-white mobile liquid with a sharp ethereal odor. It is completely soluble in water and boils at 64.5 C. It has extensive applications as an industrial and commercial solvent, antifreeze, and chemical intermediate.

Although methanol poisoning occurs primarily from the ingestion of adulterated alcoholic beverages, symptoms can occur from absorption through the lungs and skin. As recently as 1955, headaches occurred among employees using methanol in duplicating machines in small, poorly-ventilated rooms. Exposures were to concentrations in the order of 300 ppm and 800 ppm. McCord, using several species of animals, was able to demonstrate that with prolonged contact fatal amounts of methanol could be absorbed through the skin. Using the data obtained with monkeys, he estimated that one ounce of methanol absorbed through the skin could constitute a threat to man.

Impairment of vision and death from cutaneous and pulmonary absorption of methanol have been reported in the older literature.

Totally, many hundreds of cases of methanol intoxication have been reported as single cases and as groups. In 1951, a mass poisoning occurred with more than 10% mortality when 320-odd persons were affected as a result of drinking adulterated ethyl alcohol.

The symptoms of methanol intoxication vary with the dose and the time at which the patient is seen after the ingestion of the alcohol. Early, the patient is inebriated in the same manner as from ethyl alcohol, but not so deeply with an equivalent quantity. Following partial or complete recovery from inebriation, after a delay period of 6 to 24 hours after alcohol ingestion, dyspnea, abdominal pain, vomiting, visual disturbances, delirium, unconsciousness, and coma appear; death may ensue in several days.

Methyl alcohol is absorbed rapidly from the stomach and intestinal tract and is distributed throughout all body tissues somewhat proportionately to their fluid content. Since it is not metabolized in the brain, the spinal fluid

concentration may be greater than the blood concentration. A small percentage is excreted unchanged in the urine and expired air. Methanol is oxidized by the same enzyme that oxidizes ethanol, alcohol dehydrogenase. This oxidation takes place primarily in the liver at one-seventh to one-ninth the rate for ethanol. Since the enzyme is also found in the kidney, some oxidation may take place there. The oxidation products are formaldehyde and formic acid. In the presence of ethanol and methanol, alcohol dehydrogenase oxidizes ethanol preferentially; hence, there is competitive inhibition of methanol oxidation when the molar ratio of ethanol:methanol is 1:16, and there is no oxidation of methanol when the alcohols are present in equimolar concentrations.

The marked acidosis which is a prominent feature of methanol poisoning is accounted for only in part by the formaldehyde and formic acid produced. If all the methanol were converted to formic acid, the quantity would be insufficient to cause the acidosis which is observed. It is probable that the metabolites cause secondary enzyme inhibitions so that additional oxidation pathways are blocked, allowing other acids to accumulate and deplete the body alkali.

The syndrome of methanol poisoning is explained as three diseases which could be viewed as three phases of the same disease which occur sequentially: I, narcosis; II, acidosis; and III, nervous tissue destruction.

Disease I results from the acute narcotic action of methanol and is the same manifestation as is seen with other alcohols and solvents capable of causing inebriation and anesthesia. This effect is observed in all animals with doses of approximately 10 gm per kilogram. When methanol and ethanol are consumed simultaneously, as is usual, their narcotic actions are additive.

Disease II is said to occur only in primates and results from the metabolism of methanol to a toxic product, probably formaldehyde. The clinical symptoms are the result of the profound acidosis which is produced. The acidosis exceeds that which would be caused by the metabolism of methanol, and so secondary enzymatic inhibitions must take place. Disease II can be prevented if the presence of ethanol can be maintained for a sufficiently long period of time to allow methanol to be excreted unchanged. Since this phase of methanol poisoning cannot be produced precisely in small animals, and since ethanol is usually consumed before, with, or after methanol, irreconcilable statements about its toxicity have been made in the past.

That methanol may be harmless when consumed in small amounts with ethanol was shown in a report of 60 cases with a description of 8 patients who were addicted to drinking "methylated spirit," which is ethanol denatured with 4% methanol. Patients may not be seen for treatment until narcosis has passed and acidosis is present. This can be combated by large doses of alkali, the amount required being determined by the carbon dioxide-combining power.

The recommended treatment of methanol poisoning consists essentially of providing alkali as needed and ethanol. The tentatively suggested dose of

ethanol is 4.5 oz of 100 proof whiskey for a 70 kg man, followed by 3.0 oz every four hours. Care must be taken to insure that the total of both alcohols does not approach 10 gm per kilogram, the acute narcotic dose. Kendal and Ramanathan have suggested that 10 ml of ethanol per hour is near the minimum amount required to suppress completely the metabolism of methanol in human subjects.

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Toxicity of 1,1-Dimethylhydrazine Vapor

W.E. Rinehart, E. Donati, and E.A. Greene, Directorate of Medical Research, U.S. Army Chemical Warfare Laboratories, Army Chemical Center, Md. AIHA J 21:207-209, June 1960.

Introduction and Background. Utilization of 1,1-dimethylhydrazine (UDMH) in guided missile systems has promoted investigation of its potential health hazards. Previous studies have shown UDMH to be primarily a central nervous system stimulant causing convulsions and death irrespective of the route of administration.

Studies of longer duration are needed to estimate that quantity of toxicant to which man may be exposed without harmful effects. Therefore, these studies of 1,1-dimethylhydrazine vapor in rodents and dogs, 6 hours/day, 5 days/week for periods of from 6 to 26 weeks were initiated.

Discussion. The studies of the authors have demonstrated that toxic effects may be produced in rodents and dogs by repeated exposure to low concentrations of 1,1-dimethylhydrazine vapor. Atmospheric concentrations of 140 ppm (342 mg/M³) and 25 ppm (61 mg/M³) in rodents and dogs, respectively, caused serious effects such as convulsions and death. Involuntary muscular contractions, both intermittent and tonic, were seen in all animals preceding death. In acute studies, Jacobson, et al, observed this finding only in mice. Decreases in hematocrit, hemoglobin, and red blood cell count defined further the toxic effects in dogs surviving 25 ppm of UDMH. Hemosiderin in the cells of the reticuloendothelial system of these dogs was most prominent in the liver; i. e., the parenchymal and the sinusoidal cells. The changes noted in the hematopoietic system and liver, viewed with clinical hematologic findings, demonstrate that 1,1-dimethylhydrazine at the 25 ppm level caused hemolytic anemia.

At 75 ppm (183 mg/M³), rats and mice showed periods of dyspnea and lethargy; the mice showed in addition a 27% mortality. Anemia and indirect bilirubinemia in the presence of mild lethargy without loss of appetite indicated hemolysis in dogs at the 5 ppm (12.2 mg/M³) level. Splenic hemosiderosis as well as anemia noted in dogs at this level was greatly reduced as compared to a similar finding in dogs at the higher exposure level. The

order of decreasing species sensitivity to UDMH vapor is: dogs, mice, and rats. It seems likely in accidental human exposures to low concentrations of this vapor that lethargy and hemolytic anemia are the first toxic signs that would appear. Lethargy—a visible though nonspecific sign—may be more useful as a warning of impending health hazard than hematologic changes which require measurement.

Summary. Toxic effects seen in rodents from inhalation of 75 ppm and 140 ppm of 1,1-dimethylhydrazine are tremors, convulsions, and death. Dogs were significantly more sensitive; the resulting toxic effects from exposure to 25 ppm were hemolytic anemia, convulsive seizures, and death. Repeated exposure of dogs to 5 ppm for 26 weeks produced only mild toxic effects (slight lethargy, some hemolytic anemia, slight bilirubinemia). Based on the results of these experiments there seems to be no doubt that for man the maximum allowable concentration (8 hours/day, 5 days/week for prolonged periods) of 1,1-dimethylhydrazine vapor should be well below 5 ppm. Until more data and experience are available, it is suggested that 0.5 ppm be used as a guide to good industrial handling and safe practice.

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